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TRENDS IN SOVIET MILITARY CAPABILITIES IN THE PERIOD 1965–1970

Submitted by the
DIRECTOR OF CENTRAL INTELLIGENCE

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on 12 April 1960. Concurring were the Director of Intelligence and Research, Department of State; the Assistant Chief of Staff for Intelligence, Department of the Army; the Assistant Chief of Naval Operations for Intelligence, Department of the Navy; the Assistant Chief of Staff, Intelligence, USAF; the Director for Intelligence, The Joint Staff; the Assistant to the Secretary of Defense, Special Operations; the Director of the National Security Agency; and the Atomic Energy Commission Representative to the USIB. The Assistant Director, Federal Bureau of Investigation, abstained, the subject being outside his jurisdiction.

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TRENDS IN SOVIET MILITARY CAPABILITIES IN THE PERIOD 1965–1970

THE PROBLEM

To estimate trends in Soviet military capabilities in the period 1965–1970.

CONCLUSIONS

1. The pace and character of Soviet military development over the period of this estimate will be affected by many things which cannot be confidently foreseen; hence we have not attempted a detailed or exact estimate. Among the variable factors are the rate of scientific and technological advance, the course of military development in the US and other major nations, the degree of stability within the Sino-Soviet Bloc, the terms of any international agreements which may be reached for the limitation and control of armaments, and the views of Soviet leaders about the changing military requirements and opportunities presented by the international situation. (*Paras. 11–12, 23–26*)

2. The expanding national product of the USSR would, over 10 years, permit a substantial increase in military expenditures without a corresponding increase in economic burden. Moreover, the Soviet leaders could if they chose put a much greater proportion of the national product to military uses than they do today. It is impossible to predict the decisions which they will make in this connection during the next decade. In the past few years the proportion of product allocated to the military has slightly declined, and we see no reason at present to estimate that the Soviet leaders will allocate an appreciably greater proportion to military purposes. We feel certain, nevertheless, that they will insure, so far as they can, that their military power is at least equal and perhaps superior to that of any other major nation.[1] (*Paras. 18–19*)

[1] The Assistant Chief of Staff, Intelligence, USAF, believes the paragraph should be changed to read:

The Soviet leaders will, of course, view their military requirements in the light of their estimate of the military strength of those states likely to oppose their expansive aims. The Soviet leaders are endeavoring to attain at the earliest practicable date a military superiority over the US which they would consider to be so decisive as to enable them either to force their will on the US through threat of destruction, or to launch such devastating attacks against the US that, at the cost of acceptable levels of damage to themselves, the US as a world power would cease to exist. A series of successes in extending Soviet influence abroad might move them to accelerate the tempo of this endeavor, even at the risk of what they would consider a Western initiated war of desperation.

3. The equipment and weapons of the Soviet armed forces will include the latest and best types that Soviet scientific and technological effort can devise. Great emphasis will almost certainly be placed on research and development. While progress in this field is to some extent unpredictable, the scientists of the USSR are as able as those of any other nation to make important advances, and the ability of the Soviet state to direct the work of scientists into military applications may be superior to that of Western nations. Not all of the improvements and innovations which are developed will be produced in quantity or introduced into operational units; Soviet decisions on this point will depend on various factors, not the least of which will be the Soviet estimate of the nature and number of opposing weapons systems. (*Paras. 20–21, 27*)

4. Soviet military forces will almost certainly continue to be adapted to a wide variety of missions—strategic and tactical, long range and short range, large and small scale, however they may be designated. This does not exclude the likelihood of considerable changes, from time to time, in the structure or size of various elements of the Soviet military establishment, often dictated by developments in the technology of weapons and of military equipment generally. (*Paras. 14–16*)

5. The capability of the USSR to launch missiles from the ground, from the air, or from submarines and surface ships, will almost certainly increase substantially before 1965, and can, if the Soviet leaders desire, be greatly increased thereafter. The accuracy, reliability, and rapidity of handling of missiles will increase. Decoys, electronic countermeasures, and other penetration aids could be incorporated, at least in the larger missiles. (*Paras. 28–29*)

6. While the development of offensive missiles seems now to be fairly well in hand, the development of an adequate defense against them appears still uncertain. Since a tremendous strategic advantage would accrue to the side which achieved such a defense before its adversaries, the outcome of research and development efforts in this field during the period of this estimate will have great significance for the international situation. Sometime between 1963 and 1966 an antiballistic missile system for use in fixed defenses could probably become operational in the USSR; its effectiveness cannot now be estimated. It is possible that scientific advances may make entirely new means of defense practicable. We believe that the Soviets will continue to put a great deal of research effort into antimissile defense, but we are unable to predict what success they may have. (*Paras. 41–42*)

7. The use of space vehicles for reconnaissance, target surveillance, communication, jamming, and early warning is well within Soviet capabilities during the period of the estimate. Such vehicles might be used for delivery of weapons, possibly for purposes different from those served by the ICBM. We do not believe that the Soviets will have in this period a missile, or a satellite, which can destroy other satellites in orbits more than a few hundred miles high. A missile designed for use against ballistic missiles could attack satellites in lower orbits. (*Paras. 38–40, 44*)

8. The future development of Soviet nuclear weapons will almost certainly be profoundly affected by the resumption or nonresumption of nuclear testing. To reduce the size of missile warheads, for example, while maintaining or increasing the yield, may become an urgent Soviet requirement. The basis for such an accomplishment could probably be worked out in a laboratory, and the improved weapons built. We cannot be sure, however, that the Soviets would stockpile large numbers of untested weapons, or place great dependence upon them. It is particularly doubtful that they would do so if the weapons embodied radical innovations. (*Para. 22*)

9. Chemical warfare could play an increased role in Soviet weapons systems during the period. Nerve agents will remain important, but during the 1965–1970 period new families of lethal agents developed from natural poisons may become available. An additional threat may come from nonlethal incapacitating agents which affect mental and physical efficiency, and which are expected to become standard by the end of the period. Methods of delivery and dissemination are adequate for battlefield use. They are not adequate for large scale strategic use, but they may become so during the period of this estimate. The principal Soviet research efforts in biological warfare will probably continue to be in the area of development of genetically stable bacteria, rickettsia, viruses, and selected dried bacterial toxins, and in the development of insect carriers of infectious agents. Means may be developed for spreading biological warfare agents over large areas, up to thousands of square miles. (*Paras. 58–59*)

10. In general, a wide variety of improvements and innovations will add to the firepower, mobility, reconnaissance capability, and logistical endurance of the Soviet armed forces. Some of these developments are projected in more detail in the body of this estimate. Two broad lines, which are likely to be manifest in diverse ways, may be mentioned here. First is the trend, already in evidence, toward the use of missiles to supplement many earlier types of offensive and defensive weapons, and sometimes where practicable to replace them. Second is the use of nuclear propulsion, already well underway for seagoing craft, which could be adapted for air and land vehicles by the period of this estimate. (*Paras. 48–49, 51, 53–56*)

DISCUSSION

I. FACTORS INFLUENCING SOVIET MILITARY POLICIES, 1965–1970

Introduction

11. Of the various factors which will influence Soviet military policies in the period under review, some can be foreseen at present with considerable confidence, but the greater number are in large measure unpredictable. As in other estimates, we must assume that there will be no general war. We think it virtually certain that the USSR will continue to maintain a powerful military establishment, and that Soviet aims for the spread of communism throughout the world will persist. Yet the temper and style of the Soviet leadership in pursuing these aims will change from time to time. More especially it is likely that the degree of emphasis which Soviet leaders place upon military power as an instrument of policy will vary, perhaps not very widely, but sufficiently to have an appreciable effect on the pace and character of Soviet military development.

12. Among other factors which must be taken into account in attempting to project Soviet military capabilities is the fairly predictable capacity of the Soviet economy to support a military establishment, and the much less predictable decisions of Soviet leaders in allocating resources between military and other uses. Soviet scientific and technological capabilities in general are sure to be great, but we can only tentatively foresee what particular achievements of military significance may occur. Finally, the international political context through the next decade will importantly affect the magnitude of the Soviet military effort and the particular lines in which it may be concentrated.[2]

Soviet Military Policies in General

13. The Soviets have always regarded their military establishment as a vital element of national power. In the last two decades they have allocated a high proportion of their effort and skill to military purposes. They have used military power directly and indirectly as an instrument of diplomacy and aggression. They do not exclude military force as a means of achieving their interests. Yet the USSR does not consider war as the only, or even the chief, means of achieving its objectives. The Soviet attitude toward war has been shaped by their belief that the continuous struggle against non-Communist centers of power must be carried on by whatever means are advantageous to the USSR. These attitudes are so fundamentally a part of the Soviet outlook that we believe they will persist.

14. For the past several years the Soviets have given very high priority to the development of weapons with which to attack the US directly, and to defend the USSR against direct US attack. Yet the other elements of the Soviet military establishment have by no means been ignored; there has been, for example, vigorous effort in the modernization of ground forces. The Soviet military has prepared itself for various missions—strategic and tactical, long range and short range, large and small scale, however they may be designated. The Soviet interest in varied capabilities springs from a belief in the continuous nature of political struggle which, depending on the tactical objectives pursued from time to time, may involve resort to force at various levels.

15. Departure from this principle in Soviet military policies seems to us highly unlikely. It is virtually out of the question that the Soviets should abandon the development of their capabilities to attack the US directly and to defend the USSR itself, and almost as improbable that they would concentrate on these capabilities to the neglect of others. We confidently expect the USSR to maintain military forces suitable for a wide range of missions. This does not exclude considerable changes in the structure or size of various

[2] Please see the footnote of the Assistant Chief of Staff, Intelligence, USAF, to Conclusion 2 on page 1.

elements of the Soviet military establishment, often dictated by developments in the technology of weapons and of military equipment generally.

16. Another factor of some importance in its effects upon Soviet military thinking will be new blood in the High Command. By 1970 men who were but junior officers in World War II will begin to move into senior positions in the Ministry of Defense. Military theoretical development will be largely in the hands of staff colonels who entered military service after World War II. By contrast, today's marshals were the senior field commanders in World War II and many won their spurs in the Russian Civil War. While the implications of this change cannot all be foreseen, there is at least one respect in which it is likely to be significant: the technological acuteness of this new generation of senior officers will be high.

17. The armed forces will probably be still further organized along the line of missions: strategic striking forces (long and medium range missiles, sea-launched missiles, bomber and reconnaissance air forces), strategic defense forces (antimissile and air defense), and combined theater forces (mobile and airborne ground forces, with large missile components and some air and naval support). The traditional ground, naval, and air services are already less differentiated than in the West and will probably continue to develop in this direction.

Soviet Economic Capabilities

18. In recent years the cost of the Soviet military establishment, expressed in terms of US prices, has been about 40 billion dollars annually—roughly the same as the cost of the US military establishment. The Soviet figure has remained approximately constant over several years, and thus has represented a slightly declining proportion of gross national product (GNP). If the Soviets should, over the next decade, increase their military expenditures approximately in proportion to the increase in GNP, the military outlay in 1970 might reach a figure in the general range of 65–75 billion 1958 dollars. This amount could be greatly increased if the Soviets chose or felt forced to do so; it might also be reduced, leaving a larger amount for economic development programs or other uses.

19. It is clear that Soviet economic capabilities will make possible a vast expansion of military effort, if the leadership chooses to adopt such a course. To be sure, Soviet resources will be subject to many urgent claims apart from those of the military establishment, and the Soviet leaders will have to make difficult decisions respecting priorities in allocation. Within the military itself, all-out effort in all lines of development and procurement simultaneously will be out of the question; some choice will have to be made among the manifold possibilities which appear. Moreover, in any rapid military buildup there would almost certainly be shortfalls or bottlenecks, and difficulties and delays of various sorts. These considerations deserve mention, for Soviet economic capabilities are not unlimited. We cannot now see, however, that the limitations are likely to be of great consequence in building Soviet military power.

Scientific and Technical Capabilities in General

20. Vast current programs for constructing new scientific facilities, and continuous efforts to improve the organization and coordination of science and technology, reflect the increasing intensity of Soviet scientific effort. The foundation is now being laid for rapid advance in all important fields of basic and applied science during the next 10 years. The Seven-Year Plan gives priority to certain selected areas in which advances might advantageously affect economic or military development. Some of these areas are: controlled thermonuclear reaction, research on outer space, solid-state physics, semiconducters, automation, computer research, radiochemistry, electronics, geophysics, biophysics, and biochemistry.

21. The capability of Soviet scientists for contributing to military development during the next 10 years will be at least equal to that of the scientists of any other country, while the ability of the Soviet state to direct the work of scientists into military applications

may be superior. By definition, unexpected breakthroughs cannot be foreseen. Several fields may offer remarkable developments of great military significance. For example, research on high energy accelerators and electromagnetic propagation might lead to a means for destroying ballistic missiles and other targets on the ground or in air or space by means of waves or a beam of high energy particles.

22. The future development of Soviet nuclear weapons will almost certainly be profoundly affected by the resumption or nonresumption of nuclear testing. To reduce the size of missile warheads, for example, while maintaining or increasing the yield, may become an urgent Soviet requirement. The basis for such an accomplishment could probably be worked out in a laboratory, and the improved weapons built. We cannot be sure, however, that the Soviets would stockpile large numbers of untested weapons, or place great dependence upon them. It is particularly doubtful that they would do so if the weapons embodied radical innovations.

The International Political Context

23. The Soviets will, of course, view their military requirements in relation to their estimate of the military strength and political intentions of other states. If, for example, the Soviets came finally to the conclusion that the non-Communist powers were able and determined to maintain military power that the USSR had no prospect of surpassing, they might be increasingly disposed to turn the competition with the West into other channels. Within certain limits, this might result in a declining emphasis on the further growth of military power. Or, a series of successes in extending Soviet influence abroad might move them to accelerate the tempo, at the same time that it led them to prepare for the possibility of a war of desperation initiated by the weakening "imperialists." Soviet military developments will also be strongly influenced by US and other Western military developments. It is certain, for example, that the Soviets will seek at least to maintain their relative military position, in order to have reasonable assurance of the security of the USSR.[3]

24. Apart from their paramount concern with the US the Soviets, in planning their military programs over the next decade, will have to take account of the probable development of their relations with Communist China, and doubtless also with Germany and other nations. There is a high likelihood that the international power situation will become more rather than less complex in the course of the next decade. On the whole, we think that the Soviets will view the international environment as requiring them to maintain a very high level of military power.

25. One particular aspect of the international political situation—that of arms limitations—requires mention in this context. It is possible that over the next 10 years some significant degree of international arms limitation and control will be worked out. There is no way of predicting at present what form such an arrangement might take, or what bounds it might put to Soviet military development. We believe that there may be some forms of arms limitation which the Soviets will be prepared to accept, however difficult it may be to arrive at terms. Certain agreements could change the basis for an estimate of future Soviet military development.

II. TRENDS IN MILITARY DEVELOPMENT, 1965–1970

Introduction

26. The pace and character of Soviet military development over the period of the estimate will be affected by many things which cannot be confidently foreseen. The following paragraphs, therefore, are general in nature. To a great degree they concentrate on possible and probable developments in weapons systems, and in this respect they are based only partly on the evidences of past Soviet accomplishment and present Soviet interest. They largely rest upon our view of the inherent feasibility of certain lines of scien-

[3] Please see the footnote of the Assistant Chief of Staff, Intelligence, USAF, to Conclusion 2 on page 1.

tific and technological advance. Nevertheless, prediction many years ahead of scientific developments and of advances in weapons technology is a hazardous business. Possibilities which appear remote at present may materialize with unexpected rapidity. Altogether new developments cannot be ruled out of consideration. The following estimates, therefore, must be regarded as highly tentative.

27. It is also true that while Soviet research and development will proceed along a wide front, not all of the improvements and innovations which are achieved will be put on the production line. The Soviet decision to introduce new or improved weapons into operational units will depend on various factors, not least of which will be Soviet estimates concerning the nature of opposing weapons systems.

Long Range Attack Systems

28. *Ballistic Missiles.* The Soviet ICBM program will continue to be given high priority through the period of this estimate, and we expect the development of missiles with improved operational characteristics. Improved Soviet ICBMs will probably use a solid or a storable liquid propellant and all-inertial guidance with resulting reduced reaction time, increased reliability, and fewer facilities and operating personnel. The USSR will probably use both mobile launching systems and hard sites in this period.

29. We believe that at some time during the period of this estimate (1965–1970) the CEP of Soviet ICBMs, under operational conditions, could be reduced to about 1 n.m. This improved accuracy can be achieved by refinement of gyros, accelerometers and computers in inertial guidance systems, by reduction of the error in re-entry, and by improved geodetic targeting data. The Soviets may develop multiple warheads, maneuverable warheads, and decoys, to improve their chances against the enemy's antimissile defenses. They may also develop active ECM in nosecones, and materials or shapes to minimize radar cross-sections.

30. Present medium range missiles will probably be replaced by new ones—possibly by a single one—using either a solid or a storable liquid propellant, and probably having all-inertial guidance. They would possess improved operational characteristics particularly in respect to short reaction time, mobility, simplicity, and reliability.

31. During the 1965–1970 period the Soviets will almost certainly have a substantial force of missile-launching submarines. The 500–1,000 n.m. ballistic missile, which we have elsewhere estimated would be introduced in this force in the early 1960's, could probably attain a system accuracy of about 1 n.m. Improvements in missile propulsion and guidance, and in submarine navigational systems, will probably permit the introduction of a much longer range submarine-launched missile by the late 1960's.

32. *Supersonic Cruise Vehicle.* An aerodynamic cruise-type vehicle with ramjet propulsion could become operational by about 1962. Such a vehicle could be used for weapons delivery, and for high altitude long range reconnaissance by photographic, electronic or infrared means. Regardless of its actual mission, its possible employment for weapons delivery would complicate Western defense problems.

33. *Hypersonic Glide Vehicle.* Before the end of the period, an operational hypersonic glide vehicle might also be available. Such a vehicle could be manned or unmanned, and would fly at about Mach 10. We believe it unlikely that the Soviets will consider this vehicle advantageous for weapons delivery, but they may find it useful for reconnaissance.

34. *Nuclear Aircraft.* The Soviets probably could at any time fly a testbed aircraft deriving some useful thrust from a reactor during a phase of flight, and probably could fly on nuclear heat alone by 1962. We believe that a more suitable nuclear propulsion system would permit test flight by about 1964, and a first operational aircraft by about 1966.[4]

[4] The Assistant Chief of Staff, Intelligence, USAF, believes the first operational aircraft could be available in 1964.

Such an aircraft would be subsonic, but it would have long range and great duration of flight, limited by permissible crew radiation doses. Such an aircraft could be used for weapons delivery, as well as for reconnaissance and for employment in an airborne early warning system.

35. A supersonic nuclear-powered aircraft probably cannot be attained by the USSR during the period of this estimate. By the end of the period, however, the Soviets may have developed a supersonic nuclear ramjet powered cruise missile.

36. *Jet and Chemically Fueled Bombers.* A medium bomber with cruising speed around Mach 2 may be introduced sometime prior to 1965; we believe it unlikely that the Soviets will develop a new long range conventionally fueled bomber during the period of this estimate. High performance aircraft utilizing new chemical fuels such as hydrogen might be available during the period.

37. *Air-to-Surface Missiles.* If the Soviets saw sufficient advantage in doing so, they could probably introduce during the period of this estimate an air-to-surface missile with range of the order of 1,000 n.m.

38. *Missile Launching Space Vehicles.* It would be technically possible for the USSR to develop satellites or other space vehicles for launching weapons against targets on earth during the period of this estimate.

39. *Reconnaissance Satellite Vehicles.* During and before this period, the USSR could launch reconnaissance satellites equipped with photographic, electronic, or infrared detection devices both for early-warning and general target surveillance.

40. *Communications Satellite Vehicles.* The Soviets could, during and before this period, launch satellites with navigational, communications, or jamming equipment.

Air Defense Systems

41. *Antiballistic Missile Systems.* We estimate that sometime between 1963 and 1966 an antiballistic missile system, employing surface-to-air missiles, could become operational for use in fixed defenses. It would have a surveillance and early warning net of considerably greater detection capability than is currently available in the USSR, and would require a completely automatic data transmission link for coordination of the various elements of the system. We expect that the Soviets will attempt to develop countermeasures to enemy ECM and decoys. We are not able at this time to estimate the nature or the effectiveness of such an antiballistic missile system.

42. The USSR is probably exploring unconventional techniques for active defense against ballistic missiles. We cannot predict the nature or success of such studies. In any case, research and development in antimissile defenses will continue through this period.

43. The Soviets may also develop a mobile, or at least transportable, antiballistic missile system especially for protection of their field forces. We believe, that, despite the added difficulties of achieving mobility of the system and the extraordinarily short reaction time required against shorter range missiles, the Soviets may be able to have such a system during the period of the estimate.

44. *Antisatellite Systems.* The Soviets may conclude that use by the West of reconnaissance satellites will establish a requirement to attack such satellites. An antiballistic missile missile could be used for interception of satellites up to an orbit of a few hundred miles. A completely new missile would be required to intercept satellites orbiting above that range. It is unlikely that the Soviets will have such a missile in operation during the period of this estimate even if they choose to develop one. Also, we doubt that they could have an antisatellite satellite during this period.

45. *Antiaircraft Defenses.* To defend against aircraft and cruise-type missiles in the late 1960's, we believe that the Soviets will retain and improve upon the surface-to-air missile systems developed in the late 1950's and early 1960's. The overall effectiveness of these weapons systems will probably be significantly enhanced by continued refinement of system components and greater availability of nu-

clear warheads. Some light AAA guns and rockets will probably be employed to supplement missiles in low altitude coverage.

46. *Warning.* Continuing improvements of early warning detection systems, and of tracking and trajectory-predicting radars, are expected in this period. Satellites and possibly nuclear aircraft could be used for space and airborne early warning vehicles, in addition to infrared systems, land-based high frequency backscatter radars, and large conventional early warning radars. The variety of technical possibilities for this period preclude an estimate of the particular combination of systems the Soviets will succeed in developing and choose to adopt.

47. *Fighter Interceptors.* The number of fighter interceptors will continue to decline sharply through the period of this estimate, though most of those remaining will probably be all-weather interceptors armed with air-to-air missiles. We believe that the Soviets will continue research and development in supersonic interceptor aircraft into the period of this estimate, but whether new types are introduced into operational units is likely to depend mainly on whether the Soviets believe they will be useful against US or Western attack.

Field Forces

48. *General.* The general trend of development of the ground forces will probably continue to place emphasis upon improving mobility and increasing both nuclear and nonnuclear firepower. The chief developments will probably be in the fields of missile and rocket artillery, cross-country mobility, and air transportability. The field forces will continue to be equipped with improving equipment for rapid communication, for television and other battlefield surveillance systems, for amphibious operations, for night actions, and for rapid unit movements to and on the battlefield.

49. *Missile Artillery.* In addition to some of the longer range missiles already discussed, new shorter range ballistic missiles will probably also be available for support of the ground forces. New types would probably have a solid propellant and use inertial guidance, and they would have improved reliability and probably improved accuracy. The chief advantages would be their mobility, flexibility, and short reaction times. In addition, improved free-rockets with ranges up to 50 n.m. will be available. A one-man or vehicle-mounted antiaircraft guided missile, for use against such targets as low-flying aircraft and helicopters, will probably be available.

50. *Armored Vehicles.* We believe that, in addition to improved models of tanks, an entirely new main battle tank will be available by the end of the period. The primary armament of this 25–30 ton tank could be a liquid propellant gun, a recoilless rifle, or a rocket weapon. It would probably have a cruising range of at least 350 miles. It might be hermetically sealed against radioactive contamination and for submerged river crossings and amphibious operations.

51. We estimate that a program for the nuclear propulsion of land vehicles has been underway for several years. Military applications of such vehicles could be available during the period of this estimate, to include general purpose logistic vehicles and possibly other types.

52. *Airlift.* Improved tactical battlefield and strategic airlift will probably be provided by advanced assault air transports, helicopters, and perhaps vertical take-off aircraft and flying platforms. A supersonic transport aircraft could probably be available during the period of this estimate.

53. *Air Support.* Tactical aviation will decline in size as missiles continue to replace aircraft for interdiction and close support, and no new types of tactical combat aircraft are likely to be provided for these purposes.

Naval Forces

54. *General.* Technological and scientific advances will also have a profound impact on the Soviet Navy. As various new weapons, electronic equipment, and propulsion systems become available, their adaptation to naval use, where appropriate, will occur.

55. *Submarines.* The submarine fleet will assume a larger variety of employments, including missile-launching and antisubmarine warfare, as well as interdiction of Western lines of communication. The number of nuclear-powered submarines will increase, but the overall size of the submarine fleet will probably decline as the large force of conventionally powered ships built in the early 1950's becomes obsolescent. A thermoelectric nuclear propulsion system applicable to submarines may be developed, which would reduce the amount of machinery and the chances of long range acoustic detection. Antisonar coating may come into widespread use. In addition to missiles, advanced types of torpedoes with homing characteristics, and possibly armed with nuclear warheads, may become available.

56. *Surface Ships.* The surface fleet of the USSR is now undergoing conversion from a traditional force with conventional weapons to one which will employ the most advanced types of weapons. We believe that this program of modernization will continue, possibly at an accelerated pace. Nuclear-powered surface ships may be introduced into the fleet during the period. Construction of missile-launching destroyers, already begun, may be increased considerably. Missile-launching cruisers may be introduced, perhaps even before 1965. The Soviets will probably continue to experiment with hydrofoil design, and its military application may be successful during the period.

57. *Antisubmarine Warfare.* It is virtually certain that the Soviets will continue to seek means for improving their ASW capability, recognizing the importance of the US fleet ballistic missile threat. Improved means of detection will probably be achieved through hydroacoustic techniques, including advanced sonar, although infrared, magnetic, and other types of equipment may be developed for both long range research and identification of submarines. For destruction of submarines, the Soviets may develop nuclear depth charges, in addition to such possibilities as missiles and a wire-guided torpedo.

Chemical, Biological, and Radiological Systems

58. *Chemical Warfare.* Nerve agents will remain important, but during the 1965–1970 period new families of lethal agents developed from natural poisons may become available. An additional threat may come from nonlethal incapacitating agents which affect mental and physical efficiency, and which are expected to become standard by the end of the period. Methods of delivery and dissemination are adequate at present for large scale battlefield use; they are not adequate for large scale strategic use, but they may become so during the period of this estimate.

59. *Biological Warfare.* The principal Soviet research efforts will probably continue to be in the area of development of genetically stable bacteria, rickettsia, viruses, and selected dried bacterial toxins, and in the development of insect carriers of infectious agents. Means may be developed for spreading biological warfare agents over large areas, up to thousands of square miles.

60. *Radiological Warfare (Apart from Fallout Effects).* Although the Soviets have shown some interest in the idea of radiological warfare and the possibility of Soviet development in this field cannot be excluded, we think it unlikely that they will develop weapons for this purpose.